

CLAIMS

What is claimed is:

1. A bit retaining assembly for retaining a bit in a rotary tool, the rotary tool having a rotor shaft for turning the bit, comprising:
 - a chuck for coupling the bit retaining assembly to the rotor shaft;
 - a collet disposed in the chuck for receiving the bit;
 - a nut threaded onto the chuck for compressing the collet about the bit to secure the bit within the collet;
 - a housing member for receiving application of a torque; and
 - a planetary gear system for transmitting the torque applied to the housing member to the nut for rotating the nut on the chuck, wherein the planetary gear system multiplies the torque transmitted to the nut so that the torque transmitted to the nut is greater than the torque applied to the housing member.
2. The bit retaining assembly as claimed in claim 1, wherein the planetary gear system comprises a planet gear assembly for transmitting the torque between the housing member and the nut.
3. The bit retaining assembly as claimed in claim 2, where in the planet gear assembly comprises a large planet gear fixedly coupled to a small planet gear so that the large planet gear and the small planet gear are in axial alignment.
4. The bit retaining assembly as claimed in claim 2, further comprising a carrier for capturing the planet gear assembly.

5. The bit retaining assembly as claimed in claim 2, further comprising an output gear coupled to the nut for transmitting torque from the planet gear assembly to the nut.

6. The bit retaining assembly as claimed in claim 5, wherein the nut is nested in the output gear, the output gear including a projection engaging the nut for turning the nut.

7. The bit retaining assembly as claimed in claim 6, wherein the output gear disengages the nut when the nut is threaded off of the chuck allowing the nut and collet to be detached from the chuck for removal of the collet.

8. The bit retaining assembly as claimed in claim 2, wherein the housing member includes an outer surface suitable for being grasped by a user to rotate the housing member for application of the torque and a gear drive surface having a plurality of gear teeth for engaging the large planet gear so that rotation of the housing member rotates the large planet gear and the small planet gear.

9. The bit retaining assembly as claimed in claim 8, wherein the housing member comprises a ring gear.

10. The bit retaining assembly as claimed in claim 8, wherein the housing member comprises a sun gear.

11. The bit retaining system as claimed in claim 8, wherein the chuck comprises a plurality of gear teeth for engaging the large planet gear.

12. The bit retaining assembly as claimed in claim 1, wherein the planetary gear system comprises:

a plurality of planet gear assemblies for transmitting the torque between the housing member and the nut, each of the planet gear assemblies including a large planet gear fixedly coupled to a small planet gear so that the large planet gear and the small planet gear;

first and second carriers coupled together for capturing the planet gear assemblies there between; and

an output gear coupled to the nut for transmitting torque from the planet gear assemblies to the nut.

13. A bit retaining assembly for retaining a bit having a shank to the rotor shaft of a rotary tool, comprising:

a chuck for being coupled to the rotor shaft of the rotary tool;

a collet held by the chuck for receiving the shank;

a nut threaded onto the chuck for clamping the collet about the shank;

a planetary gear system for rotating the nut on the chuck; and

a housing member turned by a user for driving the planetary gear system,

wherein the planetary gear system rotates the nut on the chuck for clamping the collet about the shank to secure the shank within the bit retaining assembly when the housing member is rotated by the user.

14. The bit retaining assembly as claimed in claim 13, wherein the planetary gear system comprises a planet gear assembly for transmitting the torque between the housing member and the nut.

15. The bit retaining assembly as claimed in claim 14, wherein the planet gear assembly comprises a large planet gear fixedly coupled to a small planet gear so that the large planet gear and the small planet gear are in axial alignment.

16. The bit retaining assembly as claimed in claim 14, further comprising a carrier for capturing the planet gear assembly.

17. The bit retaining assembly as claimed in claim 14, further comprising an output gear coupled to the nut for transmitting torque from the planet gear assembly to the nut.

18. The bit retaining assembly as claimed in claim 17, wherein the nut is nested in the output gear, the output gear including a projection engaging the nut for turning the nut.

19. The bit retaining assembly as claimed in claim 18, wherein the output gear disengages the nut when the nut is threaded off of the chuck allowing the nut and collet to be detached from the chuck for removal of the collet.

20. The bit retaining assembly as claimed in claim 14, wherein the housing member includes an outer surface suitable for being grasped by a user to rotate the housing member for application of the torque and a gear drive surface having a plurality of gear teeth for engaging the large planet gear so that rotation of the housing member rotates the large planet gear and the small planet gear.

21. The bit retaining assembly as claimed in claim 20, wherein the housing member comprises a ring gear.

22. The bit retaining assembly as claimed in claim 20, wherein the housing member comprises a sun gear.

23. The bit retaining system as claimed in claim 20, wherein the chuck comprises a plurality of gear teeth for engaging the large planet gear.

24. The bit retaining assembly as claimed in claim 13, wherein the planetary gear system comprises:

a plurality of planet gear assemblies for transmitting the torque between the housing member and the nut, each of the planet gear assemblies including a large planet gear fixedly coupled to a small planet gear so that the large planet gear and the small planet gear;

first and second carriers coupled together for capturing the planet gear assemblies there between; and

an output gear coupled to the nut for transmitting torque from the planet gear assemblies to the nut.

25. A rotary tool, comprising:

a rotor shaft for turning a bit;

a bit retaining assembly for retaining the bit, the bit retaining assembly including:

a chuck for coupling the bit retaining assembly to the rotor shaft;

a collet disposed in the chuck for receiving the bit;

a nut threaded onto the chuck for compressing the collet about the bit to secure the bit within the collet;

a housing member for receiving application of a torque; and

a planetary gear system for transmitting the torque applied to the housing member to the nut for rotating the nut on the chuck,

wherein the planetary gear system multiplies the torque transmitted to the nut so that the torque transmitted to the nut is greater than the torque applied to the housing member.

26. The rotary tool as claimed in claim 25, wherein the planetary gear system comprises a planet gear assembly for transmitting the torque between the housing member and the nut.

27. The rotary tool as claimed in claim 26, where in the planet gear assembly comprises a large planet gear fixedly coupled to a small planet gear so that the large planet gear and the small planet gear are in axial alignment.

28. The rotary tool as claimed in claim 26, further comprising a carrier for capturing the planet gear assembly.

29. The rotary tool as claimed in claim 26, further comprising an output gear coupled to the nut for transmitting torque from the planet gear assembly to the nut.

30. The rotary tool as claimed in claim 29, wherein the nut is nested in the output gear, the output gear including a projection engaging the nut for turning the nut.

31. The rotary tool as claimed in claim 30, wherein the output gear disengages the nut when the nut is threaded off of the chuck allowing the nut and collet to be detached from the chuck for removal of the collet.

32. The rotary tool as claimed in claim 26, wherein the housing member includes an outer surface suitable for being grasped by a user to rotate the housing member for application of the torque and a gear drive surface having a plurality of gear teeth for engaging the large planet gear so that rotation of the housing member rotates the large planet gear and the small planet gear.

33. The bit retaining assembly as claimed in claim 32, wherein the housing member comprises a ring gear.

34. The bit retaining assembly as claimed in claim 32, wherein the housing member comprises a sun gear.

35. The rotary tool as claimed in claim 32, wherein the chuck comprises a plurality of gear teeth for engaging the large planet gear.

36. The rotary tool as claimed in claim 25, wherein the planetary gear system comprises:

a plurality of planet gear assemblies for transmitting the torque between the housing member and the nut, each of the planet gear assemblies including a large planet gear fixedly coupled to a small planet gear so that the large planet gear and the small planet gear;

first and second carriers coupled together for capturing the planet gear assemblies there between; and

an output gear coupled to the nut for transmitting torque from the planet gear assemblies to the nut.

37. A bit retaining assembly for retaining a bit in a router, the router having a rotor shaft for turning the bit, comprising:

- a chuck for coupling the bit retaining assembly to the rotor shaft;
- a collet disposed in the chuck for receiving the bit;
- a nut threaded onto the chuck for compressing the collet about the bit to secure the bit within the collet;
- a housing member for receiving application of a torque; and
- a planetary gear system for transmitting the torque applied to the housing member to the nut for rotating the nut on the chuck,

wherein the planetary gear system multiplies the torque transmitted to the nut so that the torque transmitted to the nut is greater than the torque applied to the housing member.

38. The bit retaining assembly as claimed in claim 37, wherein the planetary gear system comprises a planet gear assembly for transmitting the torque between the housing member and the nut.

39. The bit retaining assembly as claimed in claim 38, wherein the planet gear assembly comprises a large planet gear fixedly coupled to a small planet gear so that the large planet gear and the small planet gear are in axial alignment.

40. The bit retaining assembly as claimed in claim 38, further comprising a carrier for capturing the planet gear assembly.

41. The bit retaining assembly as claimed in claim 38, further comprising an output gear coupled to the nut for transmitting torque from the planet gear assembly to the nut.

42. The bit retaining assembly as claimed in claim 41, wherein the nut is nested in the output gear, the output gear including a projection engaging the nut for turning the nut.

43. The bit retaining assembly as claimed in claim 42, wherein the output gear disengages the nut when the nut is threaded off of the chuck allowing the nut and collet to be detached from the chuck for removal of the collet.

44. The bit retaining assembly as claimed in claim 38, wherein the housing member includes an outer surface suitable for being grasped by a user to rotate the housing member for application of the torque and a gear drive surface having a plurality of gear teeth for engaging the large planet gear so that rotation of the housing member rotates the large planet gear and the small planet gear.

45. The bit retaining assembly as claimed in claim 44, wherein the housing member comprises a ring gear.

46. The bit retaining assembly as claimed in claim 44, wherein the housing member comprises a sun gear.

47. The bit retaining system as claimed in claim 44, wherein the chuck comprises a plurality of gear teeth for engaging the large planet gear.

48. The bit retaining assembly as claimed in claim 37, wherein the planetary gear system comprises:

a plurality of planet gear assemblies for transmitting the torque between the housing member and the nut, each of the planet gear assemblies including a large planet gear fixedly coupled to a small planet gear so that the large planet gear and the small planet gear;

first and second carriers coupled together for capturing the planet gear assemblies there between; and

an output gear coupled to the nut for transmitting torque from the planet gear assemblies to the nut.